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EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,733	YOON ET AL.	
	Examiner	Art Unit	
	JOHANNES P. MONDT	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/15/07 has been entered.

Response to Amendment

Amendment filed 10/15/07 under 37 C.F.R. 1.116 has been entered following said Request for Continued Examination. In said Amendment Applicants substantially amended all claims at least through substantial amendments to independent claim 9. Comments on "Remarks/Arguments" are included below under "Response to Arguments".

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. ***Claims 9-16*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed,

had possession of the claimed invention. In particular, the limitation "in a rest position" as a limitation about under what condition the fuel rod support part being bent to have equiangular surface contact with a fuel rod supported by the grid spring, and hence said limitation constitutes new matter.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. ***Claim 9*** is rejected under 35 U.S.C. 102(b) as being anticipated by Oh et al (6,393,087 B1) (previously cited).

Oh et al teach (title, abstract, Figures 1-3 and cols. 1, 2, 5, 6, 7, 8 and 9) a spacer grid 2 (col. 5, l. 55-63) for placing and supporting a plurality of longitudinal fuel rods 106 (col. 1, l. 19) in a nuclear reactor fuel assembly (first sentence of the abstract), comprising

a plurality of inner strips 113 (col. 1, l. 26-28) intersecting each other to form a plurality of guide tube cells 108 (col. 1, l. 30-31) to receive guide tubes 103 (col. 1, l. 18-19) therein (see Figure 1) and

a plurality of fuel rod cells 8 or 108 (col. 1, l. 29-30 and col., col. 6, l. 22) to receive the fuel rods 6 or 106 (col. 1, l. 35-36 and col. 6, l. 44-46) therein, with a

plurality of mixing blades 32 (col. 7, l. 1-14) projecting upward from the inner strips at intersections of the inner strips (Figures 5-6, 8 and 9); and

a plurality of perimeter strips (outer strips 113; loc.cit.) each of which comprises a plurality of unit strips including intermediate unit strips and corner unit strips (necessarily so, as all intermediate strips are included in their interior), the perimeter strips (as the outer strips necessarily) encircling the intersecting inner strips and the corner unit strips forming outermost corner cells of the spacer grid (because they are cells at the corners),

with a grid spring 12/13/14 (col. 6, l. 7-10) provided on each of the unit strips, the grid spring comprising (see Figures 5 and 6):

a vertical opening 13 or 14 (col. 6, l. 7-10) formed at a central area of each of the unit strips;

a vertical support part (un-numbered trapezoid shaped end portions abutting said vertical opening on both bottom and top sides thereof) extending vertically in the vertical opening between top and bottom edges of the vertical opening (any structure abutting an opening can be said to extend in said opening); and

a fuel rod support part 12 (col. 6, l. 7-10) provided at a central portion of the vertical support part (namely: in between said vertical support part top and bottom portions), the fuel support part being bent (col. 6, l. 42-44) and thereby having the capability of providing a equiangular support surface equiangular to a fuel rod supported by the grid spring ("equiangular" meaning all angles being

equal implying contact over a non-zero-measure surface) (see the disclosure in Oh et al of a *strip-shaped* line contact through a pressing process of the elastic spring material (col. 6, l. 40) and of contact over a surface *area*: col. 6, l. 63-64).

Finally, the limitation "in a rest position" is met by Oh et al, because a pressing against the fuel rod 6 of fuel rod support part 12 is disclosed by Oh et al as an apparent equation of state rather than a transient condition, because Oh et al state that "the spring 12 thus elastically supports an elongated fuel rod 6 at the bulged portion when the fuel rod is inserted into the cell 8 of the grid element 11" (Oh et al, col. 6, l. 44+), i.e., mere insertion is enough to provide the elastic support.

In conclusion, Oh et al anticipate claim 9.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. ***Claims 9-10*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Delafosse et al (4,224,107) (previously cited and made of record previously) in view of Chun et al (6,236,702 B1) (previously cited and made of record by applicant, see IDS).

Delafosse et al teach a spacer grid 1 (col. 2, l. 49-51) capable of being used for placing and supporting a plurality of longitudinal fuel rods (fuel pins not shown; see col. 2, l. 48-64) in a nuclear reactor fuel assembly (title, col. 1, l. 5 – col. 2, l. 64), comprising a plurality of inner strips 2 and 3 intersecting each other and forming a plurality of cells A (Figure 8 and col. 2, l. 48-64) *capable* to receive guide tubes and fuel rods therein, with a plurality of mixing blades (Figures 8-9; see elevated, protruding portions of 2 and 3) projecting upward from the inner strips 2 and 3 at intersections of the inner strips; and a plurality of perimeter strips 2a and 3a ((Figure 8 and col. 2, l. 48-64) each comprising a plurality of unit strips including intermediate unit strips and corner unit strips (intermediate unit strip is shown separated from corner unit strip by 20 in Figure 8), the perimeter strips encircling the intersecting inner strips 2a and 3a encircling the intersecting inner strips 2 and 3 and the corner unit strips forming outermost corner cells of spacer grid 1 with a grid spring 5 (col. 3, l. 22-55 and Figures 4-6 and 8-9), the grid spring comprising:

a vertical opening (opening in 2a or 3a; Figures 8-9) formed at a central area of each of the unit strips;

a vertical support part 14 extending vertically in the vertical opening between central portions of top and bottom edges of the vertical opening (col. 4, l. 1-28 and Figure 5); and a fuel rod support part 6 (col. 2, l. 64 – col. 3, l. 11) provided at a central portion of the vertical support part (Figure 5).

Delafosse et al do not necessarily teach the limitation "the fuel rod support part being bent to have a equiangular support surface which is equiangular to a fuel rod supported by the grid spring".

However, it would have been obvious to include said limitation in view of Chun et al, who, in a patent on a spacer grid for a fuel assembly (title, abstract), hence analogous art, teach the spring (30) to have a curved contact portion (31) so as to be in equiangular contact with a circumferential surface of the fuel element (11) for the specific purpose of enhancing vibration suppressing and abrasion resistance forces (see abstract, Figures 3, 8 and col. 5, l. 1 – col. 6, l. 3). *Motivation* to include the teaching by Chun et al in the invention by Delafosse et al derives from the teaching by Chun et al of enhanced vibration suppressing and abrasion resistance forces (abstract, final sentence).

On claim 10: in the combined invention by Delafosse et al and Chun et al defined above, the vertical support part 14 is bent at two steps along substantially horizontal bending lines (due to the corrugated nature of the corrugated strips 5 in Delafosse et al; see Figures 3-6 and abstract; col. 2, l. 64 – col. 3, l. 11), and the fuel rod support part 6 is bent in such a way as to be equiangular with the fuel rods 11 (see Chun et al, Figures 3 and 8, and col. 5, l. 1 – col. 6, l. 3). The claimed "uniform contact pressure distribution when the fuel rod support part is in contact with each of the fuel rods" is an inherent consequence of the equiangular contact between 6 and 11 because contact conditions are invariant along the line of contact, the outer surface of 6 following the periphery of fuel rods 11.

3. ***Claims 11-12*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al (as applied to claim 1 above) in view of De Mario et al (5,303,276) (previously made of record).

On claim 11: As detailed above, Oh et al anticipate claim 9. Further according to Oh et al, each of the intermediate unit strips has a coolant flow guide vane 30 (i.e., longer one of two structures 30 shown in the upper portion of Figure 9) and a guide tap (shorter one of two structures 30 shown in an upper portion of Figure 9) on an upper edge thereof (col. 7, l. 1-14 and Figure 9) such that a plurality of coolant flow guide vanes and a plurality of guide taps are alternately arranged (col. 7, l. 33-39) along an upper edge of each of the intermediate unit strips (loc.cit. and Figure 14 and col. 7, l. 15-24)., Oh et al do not necessarily teach the further limitation that "each of the corner unit strips having either a coolant flow guide vane or guide tap on an upper edge thereof to complete an alternate arrangement of the coolant flow guide vanes and guide taps".

However, it would have been obvious to include said further limitation in view of De Mario et al, who teach upper and lower edges of the perimeter strips, and hence also of corner unit strips to have guide/protective/flow taps or vanes of different geometric dimensions bent inwardly in an alternating arrangement (Figure 3 in De Mario et al; see vanes over 320 and col. 8, l. 16-28), incorporation of the teaching in this regard by Mario et al thus completing an alternate arrangement of coolant flow guide vanes and guide taps in cooperation with the intermediate unit strips. *Motivation* to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds

in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

On claim 12: Furthermore, although Oh et al do not necessarily teach the further limitation as defined by claim12 it would have been obvious to include said further limitation in view of De Mario et al, who teach each of the intermediate cells walls to have downwardly projecting guide taps (downward protrusions thereof as shown in Figure 3) at both corners (i.e., at both the left and right corner adjacent lattice members 310 of each intermediate unit strips and each of the plurality of corner unit strips has a guide tap projecting downward on a lower edge of each of the corner unit strips (see element 330 in Figure 3 of De Mario and col. 8, l. 28-34). *Motivation* to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

4. ***Claim 13*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al and De Mario et al as applied to claim 3 above, and further in view of Delafosse et al (4,224,107) (previously made of record).

As detailed above, claim 11 is unpatentable over Oh et al in view of De Mario et al. Furthermore, each of the coolant (flow guide) vanes in Oh et al is bent toward a center of the spacer grid because each of said coolant vanes is shown, – and in order to cause a swirl of the coolant fluid: must be, bent in two orthogonal directions so as to cause a swirl, i.e., a rotation of the fluid (see Figures 8 and 9 and col. 7, l. 1-68). Said

two directions span a plane. The vector connecting each coolant flow guide vane with *a* center of said spacer grid toward a center of the spacer grid (as opposed to *the* center of said spacer grid (the latter may not even exist, in the case when the number of cells in either a row or a column is even), as any center of any element qualifies to be a center of said spacer grid). Furthermore, it is noted that Oh et al teach elements 30 to be "bent towards the center of the main flow path" (col. 7, l. 1-14), which center, when said flow path is taken as a whole, is substantially identical to the center in a horizontal cross section of the spacer grid. Oh et al also show a width of each of said guide vanes reducing from a position at which each of said guide vanes is initially bent (see Figure 6), showing a tapered shape (loc.cit.).

Oh et al do not necessarily teach the further limitation that a peak of each of the guide vanes to be rounded. However, they do indicate that its specific shape is a matter of design choice because said shape can be chosen "in accordance with a desired swirl flow" (col. 7, l. 44-49). Furthermore, it would have been obvious to include said further limitation in view of Delafosse et al, who teach the rounding of protrusions 9 over unit strips 2 and 3 (hence structurally analogous to protrusions 30 of Oh et al), where the rounding is to as to avoid jamming (col. 3, l. 12-20). *Motivation* to include the teaching by Delafosse et al immediately derives from the advantage of the avoidance of jamming.

5. ***Claim 14*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al and DeMario et al as applied to claim 11 above, and further in view of Nguyen et al (6,526,116 B1) (previously made of record).

As detailed above, claim 11 is unpatentable over Oh et al and DeMario et al. Although Oh et al nor DeMario et al necessarily teach the further limitation defined by claim 14, it would have been obvious to include said further limitation in view of Nguyen et al, who, in a patent on nuclear fuel assemblies with spacer grid ("support grid", see abstract, first sentence) and mixing vanes (loc.cit.), hence analogous art, teach each guide tap 32 to be bent in two lateral directions orthogonal to each other, hence also in the direction towards the center of the spacer grid (col. 5, l. 10-43, and Figures 1 and 2). *Motivation* to include the teaching by Nguyen et al in the invention by Oh et al and DeMario et al derives from the resultant balance of hydraulic forces across the center of the grid (see abstract).

6. ***Claims 15-16*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al as applied to claim 9, in view of Mayet et al (6,542,567 B1) (previously made of record).

As detailed above, Oh et al anticipates claim 9 and claim 9 is unpatentable over Delafosse et al in view of Chun et al. It is furthermore noted that Delafosse et al disclose inner springs 5 for those compartments A that are inner compartments (Delafosse et al, col. 2, l. 64-col. 3, l. 11), and that furthermore, Oh et al disclose contact springs 12 for each of the grid elements 11 (col. 6, l. 37-55).

Neither Oh et al nor Delafosse et al and Chun et al necessarily teach the further limitations as defined by claims 15-16.

However, it would have been obvious to include said further limitations in view of Mayet et al, who, in a patent on straps and springs for a spacer grid of a nuclear fuel

assembly, hence analogous art, teach a vertical support part 56 of perimeter springs (Figures 6-7 and col. 5, l. 10-38) and an inner support part 26 of inner grid springs 22 (col. 3, l.61 and Figures 1-2) on the inner strips that are different in structure (col. 2, l. 55 – col. 2, l. 63) (see also legends of Figures 1-2 and 6-7). In particular, the peripheral outer straps have springs that are made especially strong and disposed in the flow direction (.loc.cit.) . It would have been obvious to include the teaching by Mayet et al in the invention by Oh et al because the mechanical and neutron flux conditions are different on the periphery and in the interior, while the relatively small number of springs needed for the periphery makes it feasible to make the latter especially strong, i.e., with higher spring strength (claim 16 is thus also met) (col. 2, l. 55-60 in Mayet et al).

Response to Arguments

Applicant's arguments filed 10/15/07 have been fully considered but they are not persuasive. In particular, although objections to the Specification and claims 11-12 (see sections 1 and 2 of Remarks/Arguments) have been successfully overcome, counter to applicants' argument in traverse, Oh et al (pages 11-12 of Remarks/Arguments, section 3) specifically teach the line contact to "uniformly distribute its spring force on the fuel rods" (see "Summary of the Invention") and that "another advantage of this invention resides in that each elongated fuel rod is supported within a cell by line contact springs without using any dimple, with the surface contact springs being positioned at the same height. The spacer grid of this invention thus uniformly distributes its spring force on the spring contact area of each fuel rod, and so it almost completely prevents damage of the fuel rod due to fretting

wear" (see col. 8, l. 66 – col. 9, l. 6). Therefore, Oh et al teach a line contact distributing its spring force on an area. Any spring force exerted over an area inherently has an equiangular surface contact because spring forces do not operate in the absence of contact. This verbatim disclosure is consistent with the Drawings as well, because a single interface between the fuel rod support part 12 and the fuel rod 6 over a surface area is shown in the combination of Figures 7 and 8. Applicants argue (page 12, second paragraph) a distinction with Oh et al on the basis of their teaching of a "uniform pressure distribution", yet such is not reflected in the claim language even after amendment: a pressing against the fuel rod 6 of fuel rod support part 12 is disclosed by Oh et al as an apparent equation of state rather than a transient condition, because "the spring 12 thus elastically supports an elongated fuel rod 6 at the bulged portion when the fuel rod is inserted into the cell 8 of the grid element 11" (Oh et al, col. 6, l. 44+), i.e., mere insertion is enough to provide the elastic support. Finally, on Oh et al, as explained in the Advisory Action mailed 10/23/07, the limitation "in a rest position" is not supported by the original Specification, and hence constitutes new matter. Accordingly, the rejection over Oh et al stands, while a rejection under 35 U.S.C. 112, first paragraph, for new matter is added for all pending claims 9-16.

With regard to Applicants' arguments in traverse of the rejections over Delafosse in view of Chun et al (section 4 of Remarks/Arguments, pages 12-13) Applicants appear to have misunderstood examiner's warning on new matter: said warning in Advisory Action mailed 10/23/07 pertained to the limitation "in a rest position" (see page 2 of Advisory Action, first paragraph of "Continuation of 11". Furthermore,

Applicants' argument alleging that the "bearing-arms 14 of Delafosse do not extend from the top and bottom edges of the vertical opening" is not according to any, old or new, claim language, which instead states "a vertical support part extending vertically in the vertical opening from central portions of top and bottom edges of the vertical opening" (claim 1, lines 19-21). Said arguments in traverse are not persuasive, because element 14 extends vertically in the vertical opening from central positions (namely positions emanating from centrally located element 6) of top and bottom edges (said edges being the portions of the opening not covered or laterally coincident with element 6) of the vertical opening" (see Figures 5 and 6 and discussion thereof, col. 4, l. 1-35). Therefore, said rejections over Delafosse in view of Chun et al stand even after amendment.

With regard to Applicants' first argument (page 14, third paragraph of section 8) in traverse of the rejections of claims 15-16, counter to Applicants' allegation of "great detail" "given to" "the structure" (final paragraph of page 14), the claimed structure is introduced only in the same breath as the recited difference in structure between vertical support part and inner support part. Hence "structure" cannot but have general, ordinary meaning, not pre-defined by any claim language. Furthermore, the material difference rendered obvious by what Applicants characterize as "complex reasoning", - without, however, explaining why said reasoning is complex let alone the more important and relevant question of why it may be incorrect, said material difference *is* inherently a structural difference because every material has a different microscopic structure. That Applicants now interpret structural difference to mean, i.e., a difference

in shape and configuration (whatever that may be; "configuration" not being defined anywhere in the original Specification) unduly narrows the ordinary meaning of "structure" in the claim language. Applicants' challenge of Official Notice is responded as follows: see Rahn et al, p. 230, final paragraph, first and second sentence, confirming that an alloy of zirconium is preferable because of low neutron capture cross section. That the discussion by Rahn is within the context of cladding material does not detract from the response to said challenge, which only pertains to the official notice of zirconium alloy as having low neutron absorption. Furthermore, without prejudice, examiner has simplified the rejections as shown overleaf, said rejections being included by reference in response to said arguments by Applicants.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHANNES P. MONDT whose telephone number is (571)272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Johannes P Mondt/
Primary Examiner, Art Unit 3663